

# The Economic Value of Sangiran Museum, Central Java, Indonesia Application of Travel Cost Method

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**Abstract—** This research is an application travel cost method (TCM) at Sangiran Museum which aims to estimate the total value of benefit for visitors Sangiran Museum, willingness to pay (WTP) visitors to the activities of the addition of new facilities at the Sangiran Museum and analysed factors that affect the significant impact on the level of visits per 1000 population per year to the Sangiran Museum. This sample size was 180 people, the election is done by way of probability sampling. The results of this study indicate that the total value of benefits at Sangiran Museum admission fee is equal to zero for Rp. 728,013,743.7 (USD 80,890.42), while the total value of benefits per year, Sangiran Museum in admission rates applicable to Rp. 300,- (USD 0.03) to Rp. 532,788,743.7,- (USD 59,198.75). Magnitude average maximum willingness to pay (WTP) of visitors to the activities of the addition of new facilities at the Sangiran Museum is Rp. 11,102.63 (USD 1.23). Form of empirical model functions best in this study is the log-log form. The results of regression analysis showed that the variable cost of travel (LnTC), education (LnEDC), income (LnNC), distance (LnDIS) and age (LnAGE) significantly affect the level of significance level of 5% of visits per 1000 population per annum (LnV) the Sangiran Museum.

**Keywords—** Travel cost method; total benefits; willingness to pay; Sangiran Museum.

## I. INTRODUCTION

The existence of cultural heritage sites is susceptible to various threats, physical and non-physical threats. The physical threats are pollution, climate, weather, and non-physical are urbanization, population growth and also tourist destination. Therefore, cultural heritage sites need protection and preservation.

Sangiran primordial human site is one of Indonesia's cultural heritage sites which has designated as world heritage committee number 593 by the World Heritage. This site explains the history of homo sapiens from the Pleistocene era through discovery of fossils and artifacts artistic.

Sangiran primordial human site as cultural heritage site faces the main problems, excavation and sale of fossils and artifacts objects illegally. The government had anticipated this by issuing Law No. 5 of 1992, Objects of Cultural Property. Sangiran Museum is established by government in Krikilan village to keep and protect the fossils and artefacts.

Valuation on cultural heritage which has characteristics as public goods, can be done by non-market valuation

technique [2]. Willingness to Pay (WTP) concept useful to measure the benefits by providing economic valuation of environmental goods.

The economic valuation of cultural heritage objects uses contingent valuation methods (CVM). CVM is estimated the value of individual preferences towards non-market goods through direct disclosure. Meanwhile, travel cost method (TCM) is used to estimate the value of individual preferences towards non-market goods. The non market goods can be calculated by comparing it to value of market goods.

TCM can be used on objects of cultural heritage such as research conducted by the Poor and Smith [3]. Poor and Smith's study can minimize the TCM's limitations by analyzing the travel costs to Historic St. Mary's City of Maryland (HSMC), located in rural areas (rural location).

The research problems are the total value of benefits Sangiran museum for visitors, Willingness to Pay (WTP) of visitors to the addition of new facilities at the Sangiran Museum, and the factors that influence the rate of visits per 100 population per year to the Sangiran museum.

Aims of this research are: 1) to determine total benefit of Sangiran museum visitors and Willingness to Pay (WTP) on

the additional facilities; 2) to identify and analyse factors influencing the rate of visits per 1000 population per year to Sangiran Museum.

The expected benefits are : 1) to enrich the study of environmental valuation, especially on cultural heritage goods and also become a reference for next research, 2) the Government of Sragen Regency and Ancient Man Site Preservation Hall Sangiran in providing policy matters on Sangiran Museum management.

## II. LITERATURE REVIEW

### A. Economy and Environment

The relationship between economy and environment cannot be separated in the pattern of human life. World economic system has provided goods and services to human needs. It highly depends on the ecological system, animal, plant, and the relationship. It known as a biosphere [2].

In general, the economy entirely depends on environment associated with the needs of raw materials, waste disposal and environmental friendliness [4].

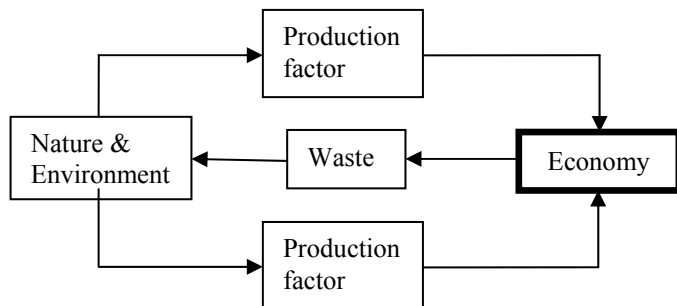


Figure 1. Economy dependency on nature and environment

Field in Muharram [6] summarizes the dependence of economy on environment by stating that the economic system is in and surrounded by nature.

According to the economic perspective, environment is an asset providing the various services. Environment is considered as a special asset because it provides life support systems for human existence, either directly or as provider of raw materials [7].

The quality of environmental assets is directly affected by the quantity and types of residuals generated by economic activity. Production possibility curve (PPC) explains the trade off concept between conventional economic output and environmental quality.

### B. Environmental Analysis

Decisions on environment policies require good information and an environmental analysis framework. It is divided into five analysis as follows [5]:

- 1) Impact Analysis  
Impact is the result generated by an existing policy. There are three types of impact analysis : environmental impact analysis, economic impact analysis and regulation impact analysis.
- 2) Cost Effectiveness Analysis  
Cost effectiveness analysis is conducted to estimate the costs of policy alternatives in order to compare it.

### 3) Damage Assessment

This analysis is used to estimate total damage of injured resources. The results can be used as source of recovery process.

### 4) Risk Analysis

The uncertainty of benefits and costs in the future also happens in environment, therefore required a risk analysis. It involves three basic stages of risk assessment : computation, valuation, and risk management.

### 5) Benefit - Cost Analysis

Benefit-cost analysis in the public sector is the equivalent of profit-loss analysis in the private sector. This analysis is used to public decision-making on non-market inputs or outputs. Four stages of benefit-cost analysis: a) specify clearly the project or program, b) describe quantitatively the input and output, c) estimate social costs and social benefits d) compare benefit and cost.

When the environmental quality decreases, benefits will be reflected in the value spent on environmental quality improvement at the desired level. The estimation of direct damage has limited on the market value. It will change and adapt to environmental pollution. It is difficult to measure it by approach of direct damage. The estimation should be used in basic concept to determine willingness to pay [6].

There are three ways to estimate WTP for improving environmental quality [8]:

#### 1) Revealed Willingness to Pay

This method reveals WTP by linking to market value. The economic valuation can be done by estimating consumer surplus and producer as well as market goods. Revealed WTP includes three methods : productivity method, hedonic pricing method and travel cost method.

#### 2) Imputed Willingness to Pay

This method reveals WTP which spend to reduce the impact of poor environmental quality. Imputed WTP includes damage cost avoided, replacement cost, and substitute cost methods. They are used to estimate the value of non-market goods and non-market services. It bases on costs for avoid loss of non-market goods or services, cost for replace environmental assets, and cost for provide services or goods on non replacement market.

#### 3) Expressed Willingness to Pay

This method reveals WTP by surveys on environmental quality change which base on hypothetical scenario.

### C. Consumer Surplus

The law of diminishing marginal utility states that the goods are consumed increases, the marginal utility of goods is likely to decrease. It means, marginal utility shows additional utility obtained from an additional unit of consumption of a commodity [9].

Consumer surplus occurs if consumers are willing to pay the value of goods and services above the price of these. It cause customer has different satisfaction by purchasing goods and services. Consumer surplus is the difference of total utility or total satisfaction of customers obtained by

consuming certain goods and total cost to consume goods [10].

#### D. Cultural Goods

Sangiran Museum is a cultural good which has same characteristics with natural goods : air, water, and scenery. Cultural and natural goods has the same characteritic as a public goods : non-rivally and non-excludable. Non-rivally means benefit of the goods can be enjoyed by one person and also another person. Non-excludable means person doesn't have exclusive propoerty goods [11].

Cultural goods has cultural value and society value such as social, historical and other cultural dimensions (Throsby in [12]). In economics, assets, property or resources are considered as capital because it can combine with inputs to product goods and services. Cultural goods has a value that can be analyse from many aspects, anthropology, sociology, and economics [12].

#### E. Previous Researchs

Previous research related to the theme of the travel cost method application in cultural heritage objects made by :

- 1) Poor and Smith [3] titled Travel Cost Analysis of a Cultural Heritage Site: The Case of Hisoric St. Mary's City of Maryland (HSMC). The variables in the study are income, ethnicity and age as dependent variables and rate of visits per 1000 population as a independent variable. It used three models : linear, semi log and log-log. The results showed that the income have an inverse influence and affect the rate of visits per 1000 population in the three models. Ethnicity and age variables also affect the rate of visits per 1000 population. The calculation of consumer surplus is significantly depent on the functions that used to estimate the demand of visitors. The value of consumer surplus on the three models are \$ 19.26, \$ 9.93 and \$ 8.00. This result can be obtained by negative price elasticity value that will cause a decrease in the number of visits to the HSMC when ticket prices increased, nor with the value of a negative income elasticity, which means that visitors who come from zones with a higher income does not like to visit the HSMC.
- 2) Hail and Thanh study [14], title Using the Travel Cost Method to Evaluate The Benefit of Cuc Phuong Tourism Park, used multiple linear regression method. The results of this study indicate total recreational benefit of 1502 million VND per year, while the total value of consumer surplus of 105 million VND per year (not including visitors who come from abroad). Additional benefits are calculated from the ongoing improvement of 166 million VND per year.
- 3) Shammin [13] study, title Application of The Travel Cost Method (TCM): A Case Study of Environmental Valuation of Dhaka Zoological Garden, used a questionnaire to collect information from visitors about the region of origin, travel distance, income groups and travel expenses. Analysis of travel cost divides the zone with 50 km interval, so there are 10 zones.

### III. RESEARCH METHOD

#### A. Research Scope

This was an application of travel cost method to reveal the visitor-use values to the Sangiran museum. This study used descriptive research methods and statistics.

#### B. Data Type

Data used in this study are primary data. The data obtained by field survey in interviews to Sangiran Museum visitor. Secondary data obtained from Site Preservation Hall Office Sangiran Ancient Humans (BPSMPS), Office of the Central Bureau of Statistics ( BPS) and the Office of Sragen Tourism, Culture, Youth and Sports (Disparbudpor) Sragen Regency.

#### C. Sampling Techniques

In this study, for sampling conducted with probability sampling methods. The targeted population of this study is the average number of visitors per week to the Sangiran Museum during 20010 amounted to 1,076.5, or rounded up to 1.077 people. The sample tehnique is

$$n = p(1 - p) \left( \frac{Z_{1/2\alpha}}{E} \right)^2 \quad (1)$$

Where :

- $n$  = sample size
- $p$  = sample proportion,  $p = 0,5$
- $Z_{1/2\alpha}$  = confidency coefficient
- $E$  = error, 5–10 percent

In this study,  $p = 0,5$ , error ( $\alpha$ ) = 1% dan  $Z_{1/2\alpha}=2,58$ . Based on the formula, the amount of sample is  $166,41 \approx 180$ . This amount represents targeted population on 16,71%.

#### D. Operational Definition of Variables

- 1) Rate of visits per 1000 population per year (V)  
This variable is the dependent variable. Rate of visits per 1000 population per year is potential number of visit per 1000 population in a variety of possible additional tariff from each zone until no more visits to Sangiran Museum per year.
- 2) Travel costs (TC)  
The cost of travel is determined by the amount of money spent during a visit to the Sangiran Museum. The costs are ticket, round trip costs, meal expenses, documentation fees and other costs.
- 3) Level of education  
Education levels are classified by lenght of education.
- 4) Individuals income per month (INC)  
Income individuals is regular monthly income, salary or wages.
- 5) Distance (DIS)  
Distance is the distance from residence to the museum Sangiran in units of kilometers.
- 6) Age (AGE)  
Age variable used is based on birth dates of visitors who do rounding down and expressed in units of years.

### E. Data Analysis

WTP analysis consist of two part, travel cost and regression. Travel cost analysis is used to estimate total benefit of Sangiran Museum and WTP visitor on new facilities. The two values is reflected on the relation between tariff and visitor rate per 1000 population in demand curve. Regression analysis is used to estimate the influence factors on visitor rate per 1000 population per year. This analysis has 3 model :

#### 1) Linear Model

$$V = \beta_0 + \beta_1 TC + \beta_2 EDC + \beta_3 INC + \beta_4 DIS + \beta_5 AGE + e_i \quad (2)$$

#### 2) Semi-Log Model

$$\ln V = \beta_0 + \beta_1 TC + \beta_2 EDC + \beta_3 INC + \beta_4 DIS + \beta_5 AGE + e_i \quad (3)$$

#### 3) Double Log Model

$$\ln V = \beta_0 + \beta_1 \ln TC + \beta_2 \ln EDC + \beta_3 \ln INC + \beta_4 \ln DIS \quad (4)$$

where:

- $V$  = visit rate per 1000 population per year
- $\beta_0$  = intersept
- $\beta_1 - \beta_5$  = Parameter
- $TC$  = travel cost
- $EDC$  = education level
- $INC$  = income
- $DIS$  = distance
- $AGE$  = age
- $e_i$  = disturbance

The option of emphirical model used Schwarz model. The best model is shown by minimum value of test. The Schwarz formula is

$$\left[ \frac{RSS}{T} \right] \times T^{k_j} / T \quad (5)$$

where :

- $RSS$  = Residual sum of squares
- $T$  = data/observe
- $k_j$  = dependent variable, without constant

Linear model

$$\left[ \frac{16.645,423}{10} \right] \times 10^5 / 10 = 16.645.423$$

Semi-Log model

$$\left[ \frac{0,674260}{10} \right] \times 10^5 / 10 = 674,26$$

Double-Log Model

$$\left[ \frac{0,342113}{10} \right] \times 10^5 / 10 = 342,113$$

Regression analysis showed that the travel cost parameter is negative (-) in the three forms of multiple regression models. It showed an inverse relationship with the visit rate per 1000 population per year. Coefficient of travel cost significantly as evidenced by a probability value of less than 5% significance level for all three forms of the model. Coefficient of income in the third regression model is negative (-).

These results show an inverse relationship with level of requests per 1000 population per year are not in accordance with reference various valuation studies of cultural heritage sites before, except for Poor and Smith research [3]. Hanley in Poor and Smith [3] have found an association between WTP of rural recreational area with an upside-down revenue.

One explanation of this relationship is related to urban high-income individuals do not make Sangiran museum located in rural areas as a major travel destination. In the linear model and semi-log value of the income coefficient is not significant at level 5%, while in double-log model of influence. Coefficient on the variable of education, distance and age are significant at 5% level only on double-log model, even in the linear model, coefficients of the three variables are very small effect on the number of visits per 1000 population per year. The best model is double-log model.

### IV. RESULT

The model is shown influence of variable cost of travel ( $\ln TC$ ), education ( $\ln EDC$ ), income ( $\ln INC$ ), distance ( $\ln DIS$ ) and age ( $\ln AGE$ ) to visit rate per 1000 population per year ( $V$ ) of Sangiran Museum.

$$\ln V = 33,01 - 3,23 \ln TC + 5,79 \ln EDC - 0,98 \ln INC - 1,26 \ln DIS + 3,12 \ln AGE \quad (6)$$

#### A. Travel Cost (TC)

The paremeter TC is -3,23. It means if the 1% increase of travel cost in average, will give impact to decrease of visit rate per 1000 population per year as 3.23%.

Sangiran Museum is in rural areas, relatively far from the town. It causes the increase of travel expenses, cost of fuel, meals, and other costs. Based on demand theory, the greater travel costs the lower visit rate per 1000 population.

#### B. Education (EDC)

The paremeter EDC is 5,79. It means if the 1% increase of education in average, will give impact to increase of visit rate per 1000 population per year as 5,79%.

Sangiran Museum is a special tourist destination (DTW), which a special interest or knowledge on archeology. This place has fossil collections and ancient artifacts. Consequently, it needs people who has enough education level. The survey said that the respondents have the average education level between 10-14 years.

#### C. Income (INC)

The paremeter INC is -0,98. It means if the 1% increase of income in average, will give impact to increase of visit rate per 1000 population per year as 0,98%.

Based on the survey, most of visitors is upper middle income. Mostly, they came by car. They did not only went to Sangiran as a major destination. They also visited Kraton Surakarta Surakarta, Mangkunegaran and Batik museum.

#### D. Distance (DIS)

The paremeter DIS is -1,26. It means if the 1% increase of distance in average, will give impact to decrease of visit rate per 1000 population per year as 1,26%.

The further the distance the less the desire to travel. The majority of visitors come from Sragen, the average distance is 16:38 km.

#### E. Age (AGE)

The parameter AGE is 3,12. It means if the 1% increase of age in average, will give impact to increase of visit rate per 1000 population per year as 3,12%.

The average age of respondent is in productive age, about 19-22 and 23-50 (71.7%). It has shown a positive relationship between age and level of visits per 1000 population per year.

### V. DISCUSSION

Improvement of service quality such as : direction signs, brochure, tour guide, and information center. Additional facilities development such as : exhibition space, audio visual room and a amphitheater, bookstore, and also automatic teller machines (ATMs). Local community participation by hiring local residents to fill vacancies-jobs as tour guides or security guards. It takes an understanding of perception between the central government, represented by the Center for Preservation of Ancient Sites Sangiran Human, Sragen Regency Government, UNESCO and the community around the museum. Another valuation tool, likes the contingent valuation method (CVM), is needed in assess the total economic value, both use value and non-use value of the existence of the Sangiran Museum.

### VI. CONCLUSION

The amount of the average maximum willingness to pay (WTP) per visitor to the activities of the addition of new facilities at the Sangiran Museum Rp. 11,102.63,- (USD 1.31). Best form function on the empirical models is double-log model. Regression analysis showed that the variable cost of travel (LnTC), education (LnEDC), income (LnINC), distance (LnDIS) and age (LnAGE) have a significant effect on the level of significance of 5% of the level of visits per 1000 population per year (LnV) to Sangiran museum.

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